Copper Research Update

Zespri® Kiwifruit

KVH KIWIFRUITVINEHEALTH

Agenda

- Copper resistance monitoring
- Evaluating copper phytotoxicity
- Results on efficacy
- Grower experience of copper efficacy

COPPER RESISTANCE

Managing resistance

- Many bacteria have the mechanisms for metal resistance
- Microbial tolerance to copper is rare; however,
- Copper resistance has been found in some *Pseudomonas* sp., e.g. Pss in stone fruit
- Therefore:
  - Use techniques to avoid resistance build-up:
  - Monitor

Resistance monitoring

- Samples collected from BOP orchards
- Orchards that have been using copper
  - November 2011 – 18 Psa-V positive orchards
  - March 2012 – 6 Psa-V positive orchards
  - September 2012 – 74 Psa-V positive KPINS
  - Continue in November 2012 & March 2013
- Samples taken from recent infections

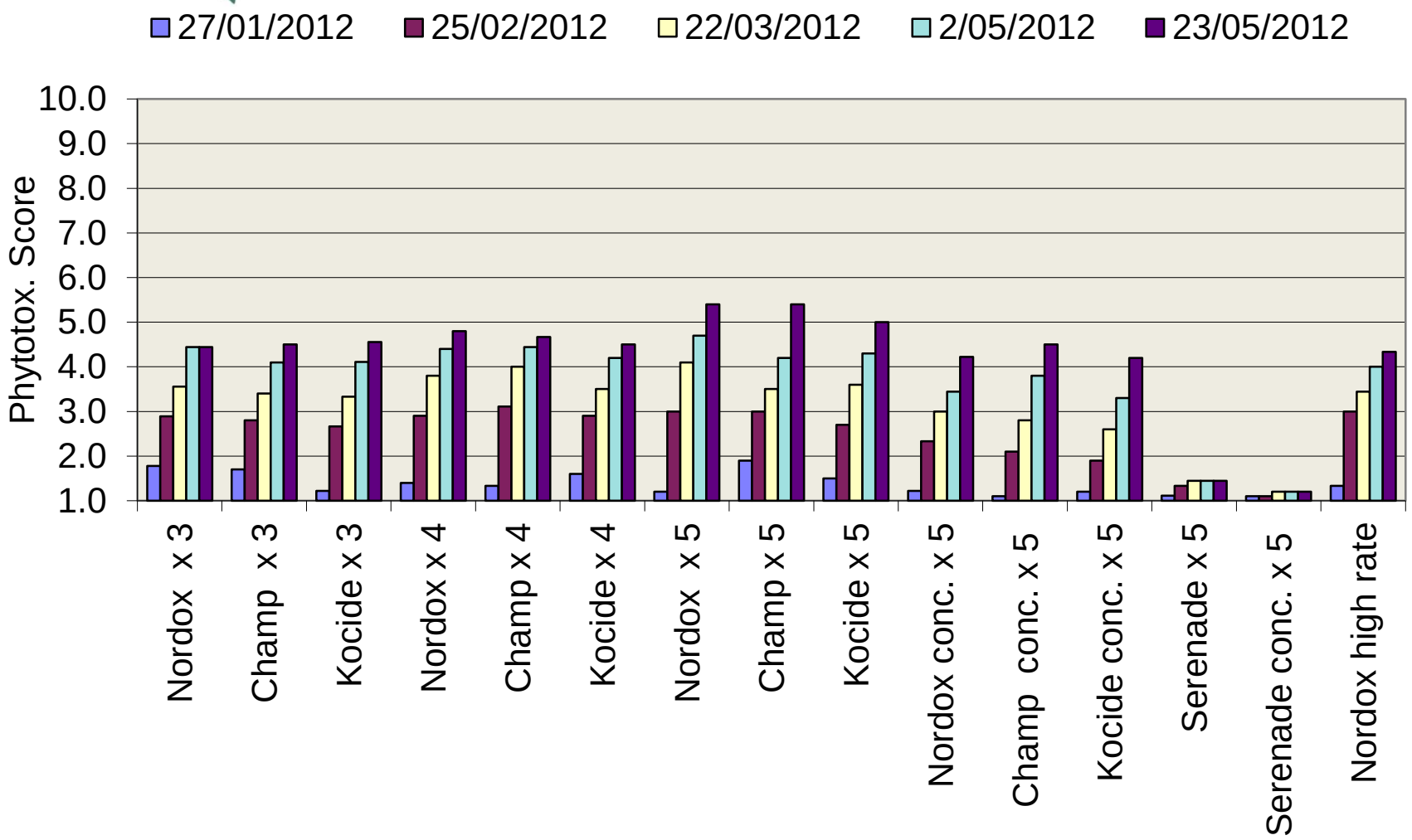
TO DATE NO RESISTANCE OBSERVED

COPPER PHYTOTOXICITY

Hayward

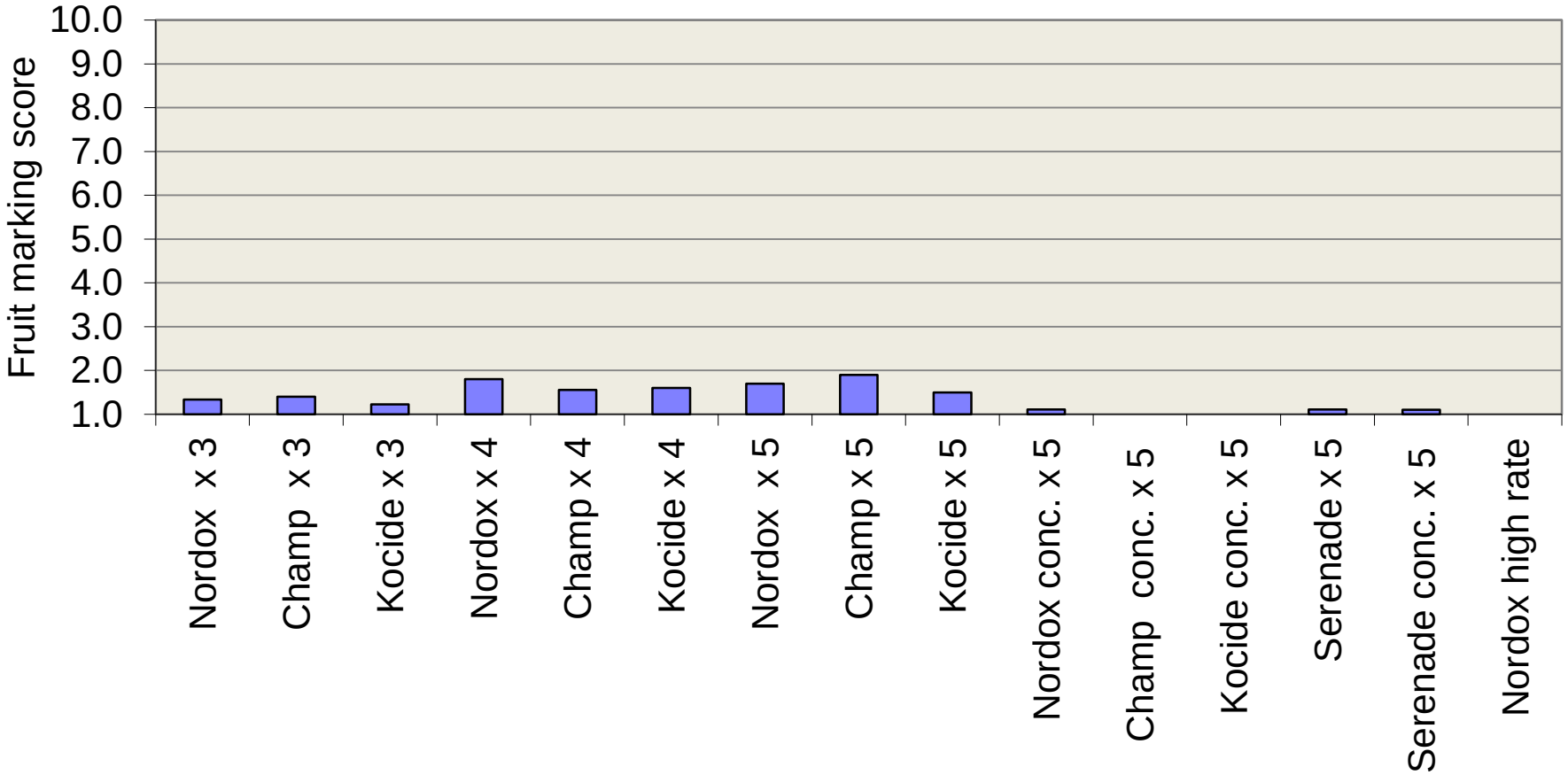
- Waikato trial:
  - Kocide (90g/100L), Champ (75g/100L) or Nordox (37.5g/100L) – dilute spray
  - 3, 4 or 5 applications at monthly intervals
  - Kocide, Champ or Nordox – concentrate with DuWett – monthly for five months
  - Nordox at 2 x summer rate in slow drying cond.

All Cu treatments gave some leaf phyto



Minimal fruit phyto observed

23 May 2012



Gro-Chem Trial

Treatment	Rate per 100L	Cu per 100L	Day 1 10/12/11 1000L	Day 30 6/1/12 1000L	Day 60 10/2/12 1500L	Day 90 9/3/12 1500L
Control						
Nordox 75WG	37.5g	28	Y	Y	Y	Y
Nordox New	28g	13	Y	Y	Y	Y
Kocide Opti	94g	28	Y	Y	Y	Y
Champ DP	75g	28	Y	Y	Y	Y
Nordox + Alga	37.5g + 100g		Y	Y	Y	Y

Gro-Chem Trial

- Some low level leaf phytotoxicity observed
- Some fruit staining – highest 20%
- Small reduction in staining using lactic acid
- Level of fruit marking did not change following a period of cool storage
  - Small increase for Nordox + Alga
- Fruit size was not impacted
- All fruit made export grade

NuFarm & HortiGro Trials

- Hayward and Hort16A
- Leaf & fruit phytotoxicity from range of products
- Leaf phytotox:
  - Seen in Hort16A after 2 or 3 treatments
  - Seen in Hayward after 5 treatments
- Fruit phytotox:
  - Observed on both cultivars
  - In Hayward disappeared by harvest so no rejects
  - In Hort16A still present at harvest

G3

- Opotiki trial:
  - Nordox 75WG (37.5g/100L) + Latron B-1956
  - Single application at 36, 60, 82, 98, 132 or 161 days after fruitset
- Harvest assessment:
  - No leaf russet observed
  - Fruit weight not significantly affected
  - Indication of reduced DM
  - Fruit russet from treatment 36 days after fruitset

France

- Hayward & Hort16A
- Nordox 75WG (25g/100L), Nordox 75WG + SticMan, Kocide 2000 (70g/100L), Kocide 2000 + SticMan
- Treatments commenced at 3 timings:
  - 2, 3 or 4 weeks after fruit set
- Receiving either 3 or 6 (5 for Hayward) applications

France

- No effect on fruit weight
- Copper treatments didn't mark fruit
- Addition of a spreader didn't increase marking
- Increasing the number of copper applications didn't increase marking
- Timing of first application didn't affect fruit marking
- Indication that copper advancing colour change in Hort16A

Pollination

- Hayward
- Newly opened flowers selected over 5 consecutive days
- Nordox 75WG applied to run-off at 37.5g/100L
- Copper sprays reduced seed numbers and FW
- Effects were largest on younger flowers

Post-harvest

- Hayward; Kocide, Kocide + DuWett, Serenade
- Applied January, February, March & April

- Copper treatment had no effect on:
  - SSC, fruit firmness or DM
  - Weight loss during storage and shelf-life
  - Incidence of disorders or rots
- Low level storage stain with Kocide (0.3%)

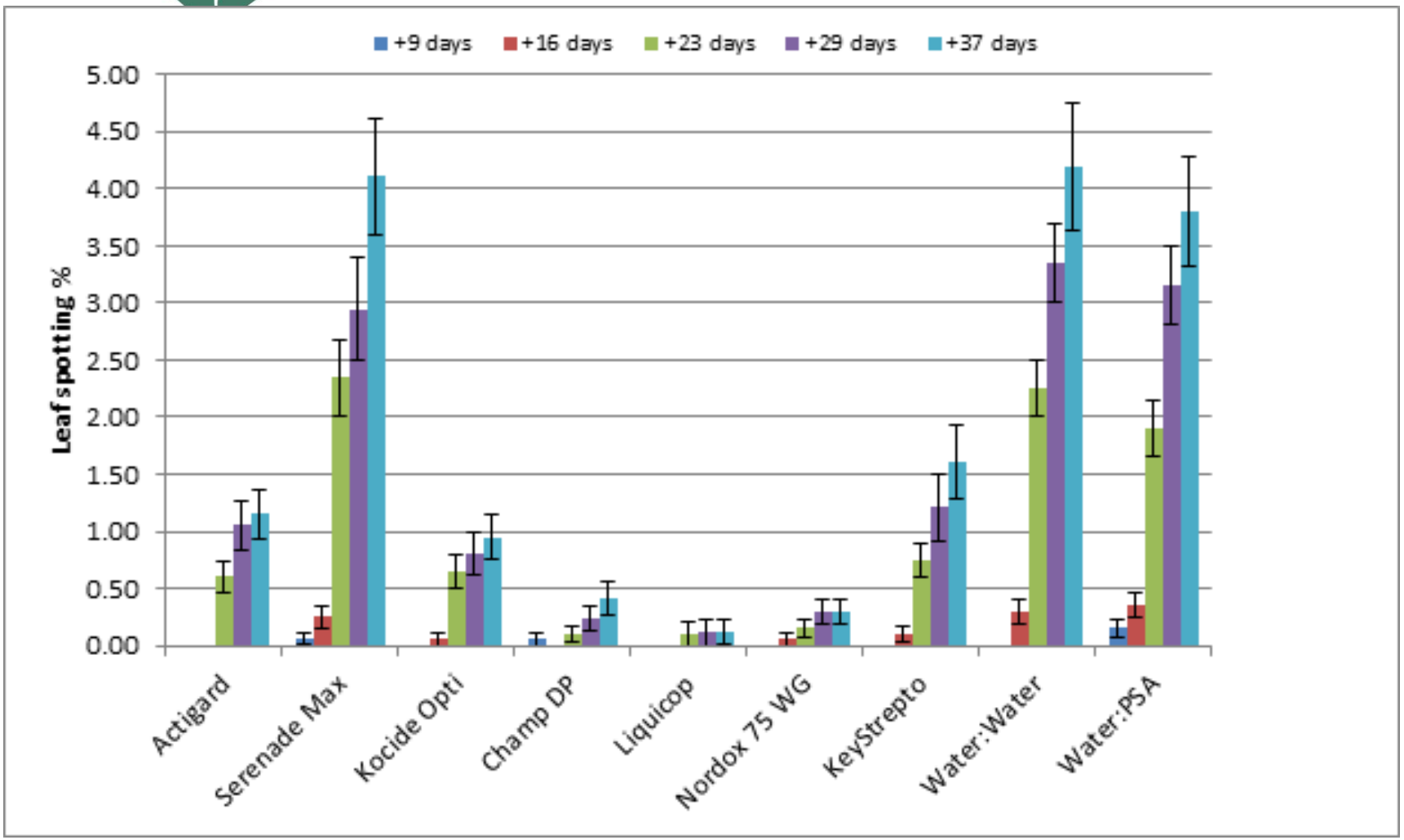
Summary

- Cu during flowering can impact on fruit size
- Leaf phytotoxicity observed in Hayward & Hort16A
- Fruit marking/russet observed in Hayward, Hort16A & G3
- Phyto not increased by adding DuWett
- Indication of effects on DM in G3
- Not affecting storage

Trial in place to investigate copper safety window!

COPPER EFFICACY

Trial 4 - Hayward



Grower Experience with Copper

TIM TORR